16.1.3 Field test data. The field test report should include the following data for the Method 1 and wall effects traverse.

16.1.3.1 Data for each traverse point. The field test report should include the values specified in section 16.1.3.2 of Method 2F (when using Method 2F) or 2G (when using either Method 2 or 2G) for each Method 1 and wall effects traverse point. The provisions of section 8.4.2 of Method 2H apply to the temperature measurements reported for wall effects traverse points. For each wall effects and Method 1 traverse point, the following values should also be included in the field test report.

(a) Traverse point identification number for each Method 1 and wall effects traverse point.

(b) Probe type.

(c) Probe identification number.

(d) Probe velocity calibration coefficient (i.e., C_p when Method 2 or 2G is used; F_2 when Method 2F is used).

For each Method 1 traverse point in an exterior equal-area sector, the following additional value should be included.

(e) Calculated replacement velocity, $\hat{v}e_j$, accounting for wall effects.

16.1.3.2 Data for each run. The values specified in section 16.1.3.3 of Method 2F (when using Method 2F) or 2G (when using either Method 2 or 2G) should be included in the field test report once for each run. The provisions of section 12.8 of Method 2H apply for calculating the reported gas volumetric flow rate. In addition, the following Method 2H run values should also be included in the field test report.

(a) Average velocity for run, accounting for wall effects, $\hat{v}_{avg}$.

(b) Wall effects adjustment factor derived from a test run, WAF.

16.1.3.3 Data for a complete set of runs. The values specified in section 16.1.3.4 of Method 2F (when using Method 2F) or 2G (when using either Method 2 or 2G) should be included in the field test report once for each complete set of runs. In addition, the field test report should include the wall effects adjustment factor, $\bar{W}\bar{A}\bar{F}$, that is applied in accordance with section 12.7.1 or 12.7.2 to obtain the final wall effects-adjusted average stack gas velocity $\hat{v}_{final}$ or $\hat{v}_{final(k)}$.

16.1.4 Quality assurance and control. Quality assurance and control procedures, specifically tailored to wall effects testing, should be described.

16.2 Reporting a Default Wall Effects Adjustment Factor. When a default wall effects adjustment factor is used in accordance with section 8.1 of this method, its value and a description of the stack or duct's construction material should be reported in lieu of submitting a test report.

17.0 *References.*

(1) 40 CFR Part 60, Appendix A, Method 1'Sample and velocity traverses for stationary sources.

(2) 40 CFR Part 60, Appendix A, Method 2'Determination of stack gas velocity and volumetric flow rate (Type S pitot tube).

(3) 40 CFR Part 60, Appendix A, Method 2F'Determination of stack gas velocity and volumetric flow rate with three-dimensional probes.

(4) 40 CFR Part 60, Appendix A, Method 2G'Determination of stack gas velocity and volumetric flow rate with two-dimensional probes.

(5) 40 CFR Part 60, Appendix A, Method 3'Gas analysis for carbon dioxide, oxygen, excess air, and dry molecular weight.

(6) 40 CFR Part 60, Appendix A, Method 3A—Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (instrumental analyzer procedure).

(7) 40 CFR Part 60, Appendix A, Method 4—Determination of moisture content in stack gases.

(8) Emission Measurement Center (EMC) Approved Alternative Method (ALT–011) ''Alternative Method 2 Thermocouple Calibration Procedure.''

(9) The Cadmus Group, Inc., 1998, ''EPA Flow Reference Method Testing and Analysis: Data Report, Texas Utilities, DeCordova Steam Electric Station, Volume I: Test Description and Appendix A (Data Distribution Package),'' EPA/430–R–98–015a.

(10) The Cadmus Group, Inc., 1998, ''EPA Flow Reference Method Testing and Analysis: Data Report, Texas Utilities, Lake Hubbard Steam Electric Station, Volume I: Test Description and Appendix A (Data Distribution Package),'' EPA/430–R–98–017a.

(11) The Cadmus Group, Inc., 1998, ''EPA Flow Reference Method Testing and Analysis: Data Report, Pennsylvania Electric Co., G.P.U. Genco Homer City Station: Unit 1, Volume I: Test Description and Appendix A (Data Distribution Package),'' EPA/430–R–98–018a.

(12) The Cadmus Group, Inc., May 1999, ''EPA Flow Reference Method Testing and Analysis: Findings Report,'' EPA/430–R–99–009.

(13) The Cadmus Group, Inc., 1997, ''EPA Flow Reference Method Testing and Analysis: Wind Tunnel Experimental Results,'' EPA/430–R–97–013.

(14) National Institute of Standards and Technology, 1998, ''Report of Special Test of Air Speed Instrumentation, Four Prandtl Probes, Four S-Type Probes, Four French Probes, Four Modified Kiel Probes,'' Prepared for the U.S. Environmental Protection Agency under IAG No. DW13938432–01–0.

(15) National Institute of Standards and Technology, 1998, ''Report of Special Test of Air Speed Instrumentation, Five

Autoprobes,'' Prepared for the U.S. Environmental Protection Agency under IAG No. DW13938432–01–0.

(16) National Institute of Standards and Technology, 1998, ''Report of Special Test of Air Speed Instrumentation, Eight Spherical Probes,'' Prepared for the U.S. Environmental Protection Agency under IAG No. DW13938432–01–0.

(17) National Institute of Standards and Technology, 1998, ''Report of Special Test of Air Speed Instrumentation, Four DAT Probes,'' Prepared for the U.S. Environmental Protection Agency under IAG No. DW13938432–01–0.

(18) Massachusetts Institute of Technology (MIT), 1998, ''Calibration of Eight Wind Speed Probes Over a Reynolds Number Range of 46,000 to 725,000 per Foot, Text and Summary Plots,'' Plus Appendices, WBWT–TR–1317, Prepared for The Cadmus Group, Inc., under EPA Contract 68–W6–0050, Work Assignment 0007AA–3.

(19) Fossil Energy Research Corporation, Final Report, ''Velocity Probe Tests in Non-axial Flow Fields,'' November 1998, Prepared for the U.S. Environmental Protection Agency.

(20) Fossil Energy Research Corporation, ''Additional Swirl Tunnel Tests: E-DAT and T-DAT Probes,'' February 24, 1999, Technical Memorandum Prepared for U.S. Environmental Protection Agency, P.O. No. 7W–1193–NALX.

Table 2H-1. Distance from the Wall for the Interior Boundary, d_b, of a Method 1 Exterior Equal-Area Sector as a Function of the Stack or Duct Radius, r, and Number of Method 1 Traverse Points

Number of Method 1 Traverse Points	d_b
16	0.134 × r
20	0.106 × r
24	0.087 × r
28	0.074 × r
32	0.065 × r
36	0.057 × r
40	0.051 × r
44	0.047 × r
48	0.043 × r

Table 2H-2 Default and Minimum Acceptable Calculated Wall Effects Adjustment Factors

		Brick and Mortar Stacks	All Other Stacks and Ducts
Default WAF		0.9900	0.9950
Minimum Acceptable WAF	**Partial Traverse**	0.9800	
	Complete Traverse	0.9700	

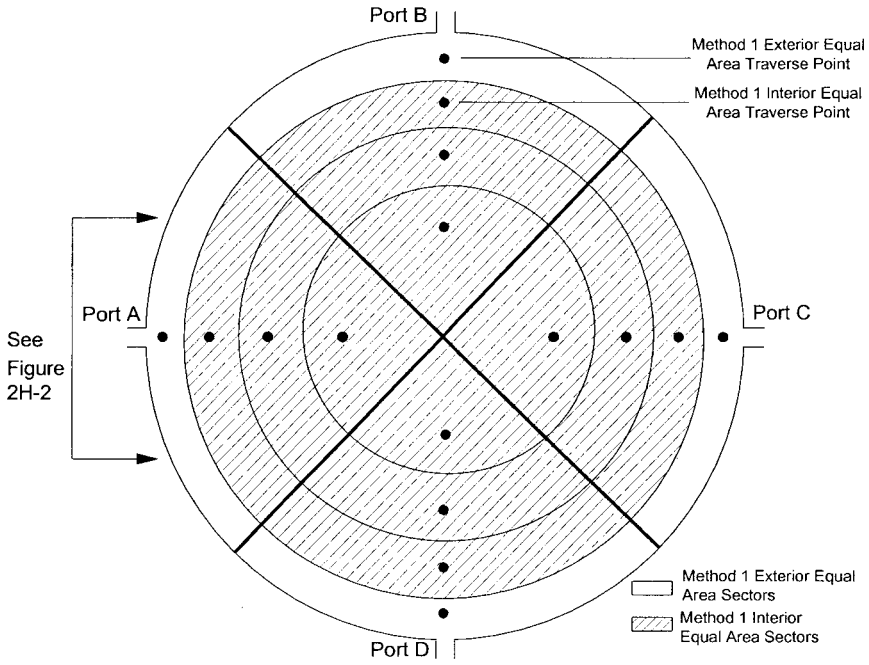

Figure 2H-1. Method 1 exterior and interior equal-area sectors with traverse points indicated.

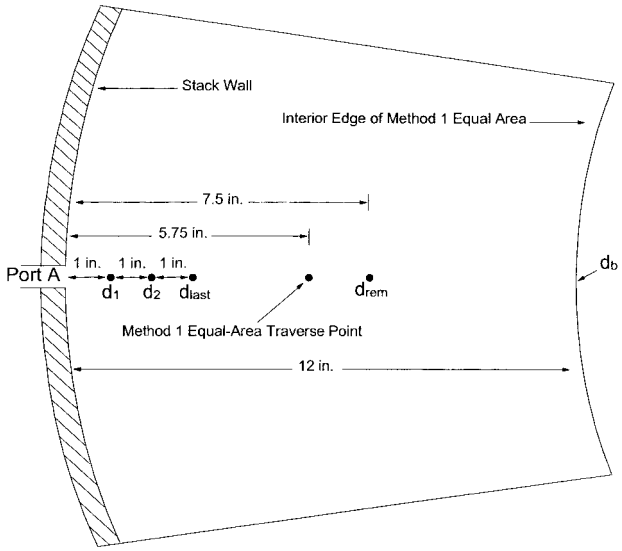

Figure 2H-2. Figure showing part of a Method 1 equal-area sector closest to the stack wall with three illustrative wall effects points at 1 in. intervals, the Method 1 equal-area traverse point, and d_{rem} for a 15 ft diameter stack.[1]

[1] Metric equivalents of English units used in Figure 2H-2 are as follows: 1 in. = 2.5 cm; 5.75 in. = 14.6 cm; 7.5 in. = 19.0 cm; 12 in. = 30.5 cm; and 15 ft = 4.6 m.

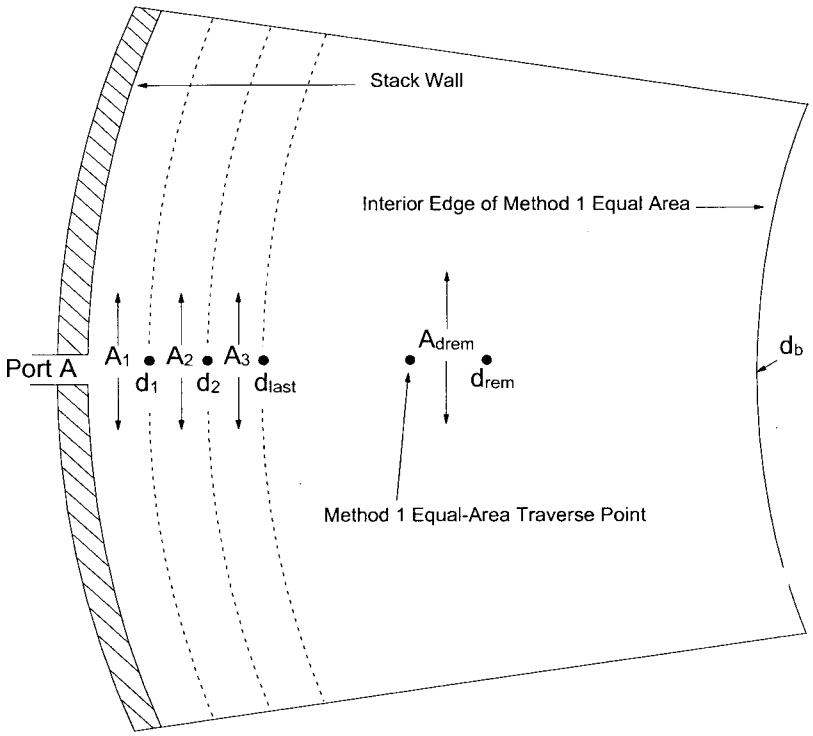

Figure 2H-3. Figure showing part of a Method 1 equal-area sector closest to the stack wall with three illustrative sub-sectors between the stack wall and d_{last} and the sub-sector represented by d_{rem}. A_1 is the area between the stack wall and d_1, A_2 is the area between d_1 and d_2, A_3 is the area between d_2 and d_{last}, and A_{drem} is the area between d_{last} and the interior edge of the Method 1 equal-area sector.

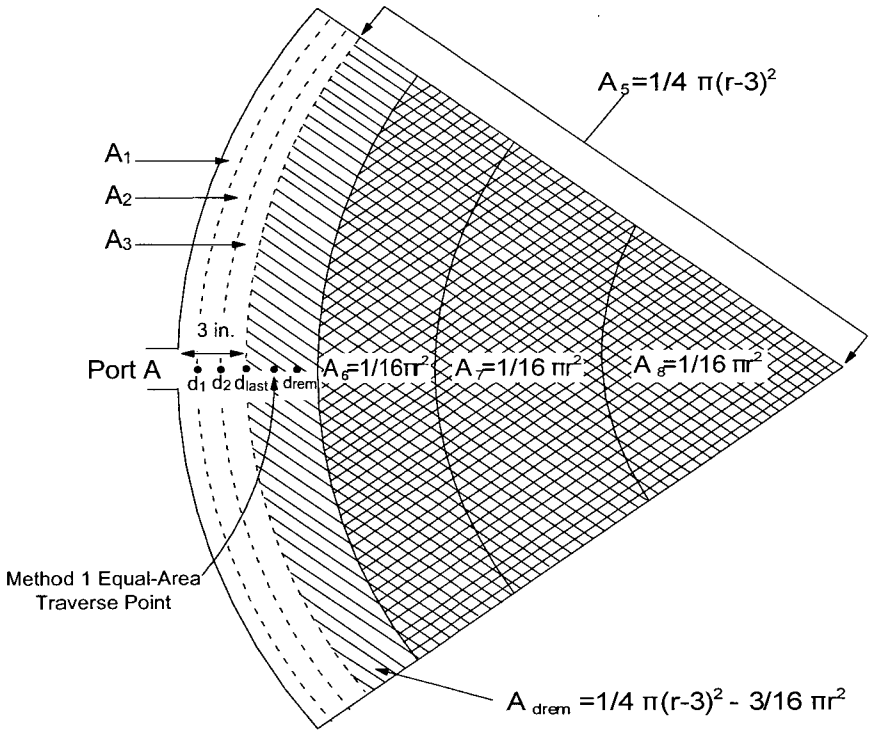

Figure 2H-4. Figure illustrating the calculations in Equation 2H-12 used to calculate the cross sectional area of the sub-sector between d_{last} and the interior edge of the Method 1 sector closest to the stack wall (A_{drem}) for a 16-point Method 1 traverse. The Method 1 equal-area traverse point and four wall effects traverse points (d_1, d_2, d_{last}, and d_{rem}) within the Method 1 sector closest to the stack wall are also shown.[1]

[1] All dimensions are given in in. Metric equivalents (in cm) are as follows: 3 in. = 7.6 cm; A_5 = 1/4 π(r-7.6)^2; and A_{drem} = 1/4 π(r-7.6)^2 - 3/16 πr^2.

Form 2H-1. Calculation of Wall Effects Replacement Velocity Values (16-Point Method 1 Traverse)

1st Probe Type/ID/Pts. Sampled: _____ Tester(s): _____

2nd Probe Type/ID/Pts. Sampled: _____ Affiliation: _____

Entry Port ID (e.g., A, B, C, or D): _____

1. Diameter of the stack or duct (ft)		Radius, r, of the stack or duct (in.) (= diameter × 6)	

2. Location (column A), measured and decay velocities (columns B and C), and volumetric flow (column G) associated with each successive wall effects traverse point.

(A)	(B)	(C)	(D)	(E)	(F)	(G)
Distance (d) from Wall	Measured Velocity (v_d) at Distance d	Decay Velocity ($vdec_d$)	Intermediate Calculations		Area of Sub-sector (A_d)	Volumetric Flow in Sub-sector (Q_d)
		$\frac{v_{d-1}+v_d}{2}$ Note: $v_0 = 0$	$\frac{1}{4}\pi[r-d+1]^2$	$\frac{1}{4}\pi[r-d]^2$	(Col. D - Col. E)	(Col. C × Col. F)
(*in.*)	(*ft/sec*)	(*ft/sec*)	(*in.*^{2})	(*in.*^{2})	(*in.*^{2})	(*ft-in.*^{2}/*sec*)
$d = 1$						
$d = 2$						
. . .						
d_{last}						

Note: $d_{last} \leq 0.1340\ r$, where r is the radius of the stack or duct. See section 8.2.2.3 of the method.

3. Total volumetric flow for all sub-sectors located between stack wall and d_{last} (total Col. G).	
4. Volumetric flow for remainder of the Method 1 equal-area sector.	
a. Velocity measurement at distance d_{rem} from stack wall (v_{drem}). (If d_{rem}- d_{last}<½ in., then no measurement at d_{rem} is necessary. Enter the velocity at d_{last} on this line.)	
b. Total area in remainder of Method 1 equal-area segment (A_{drem}). Subtract $\frac{3}{16}\pi(r)^2$ from last entry in item 2, column E, and enter the result on this line.	
c. Multiply values on lines 4a and 4b. (Q_{drem})	
5. Wall effects-adjusted velocity in the Method 1 equal-area sector.	
a. Add the values on lines 3 and 4c. (Q_T)	
b. Divide line 5a by $\frac{1}{16}\pi(r)^2$. The resulting value is one of four "replacement" point velocity values adjusted for wall effects, $\hat{v}e_j$, as derived in Equation 2H-16.	
6. Substitute the value shown in 5b for the unadjusted velocity value in the Method 1 sector. (See Eq. 2H-18.)	

Notes: 1. Column B: If no measurement is taken at distance d, enter the velocity value obtained at the first subsequent traverse point where a measurement was taken, followed by the letters "NM". See section 8.7.1.2.

2. For clarity, only English units are shown in this form. Following are metric equivalents of the English units used in the form. In row 2, column A: 1 in. = 2.5 cm; 2 in. = 5.1 cm. In row 2, column D: If metric units (cm) are used, the term $\frac{1}{4}\pi(r-d+1)^2$ must be changed to $\frac{1}{4}\pi(r-d+2.5)^2$. In row 4a: ½ in. = 12.7 mm. Throughout the form, the metric equivalents of *in.*, *in.*^{2}, *ft*, *ft/sec*, and *ft-in*^{2}*/sec* are *cm*, *cm*^{2}, *m*, *m/sec*, and *m-cm*^{2}*/sec*, respectively.